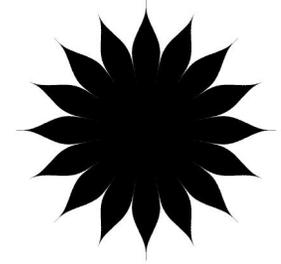


Life-Finder S. Heap / GSFC

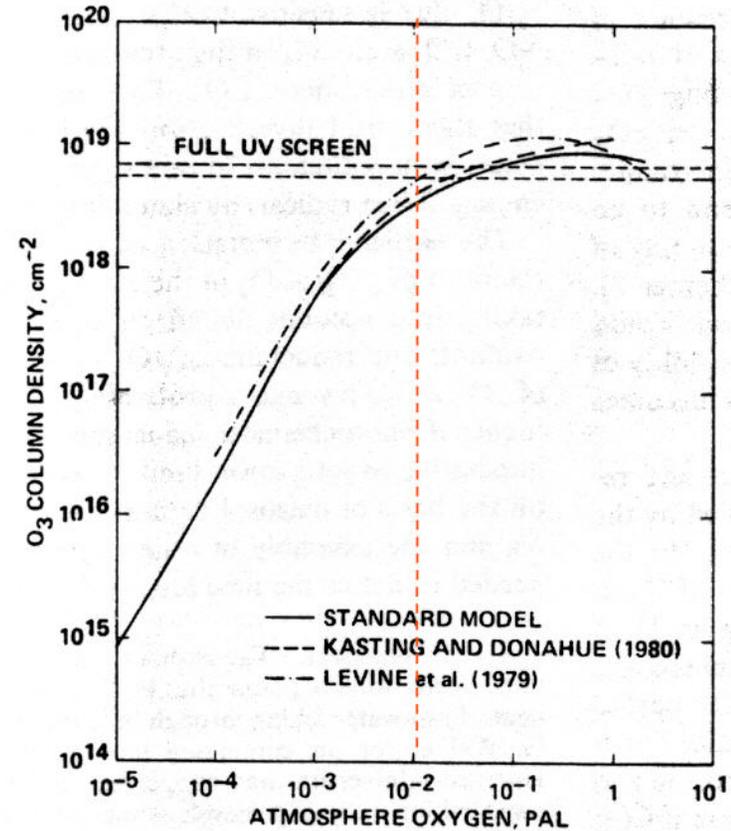
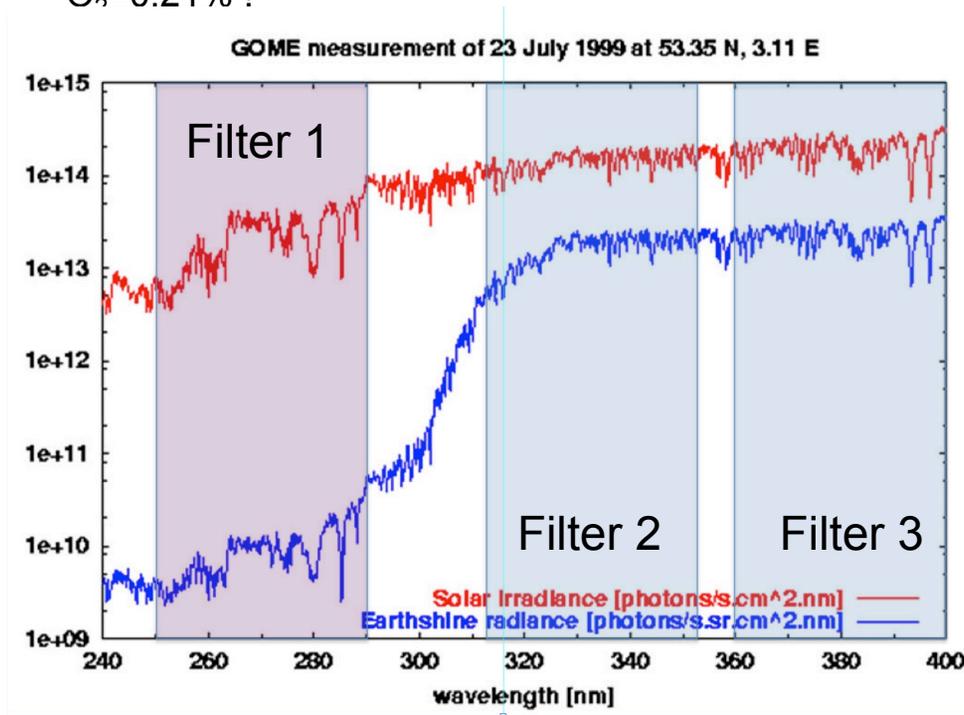


A 4-m UV/optical telescope + external occulter will be the most powerful life-finder telescope, because

(1) it is sensitive to low amounts of O_2

Left: Spectra of the Earth by GOME show that O_3 absorption band is saturated at $\lambda < 300$ nm

Right: the O_3 band is expected to be saturated down to $O_2 = 0.21\%$!



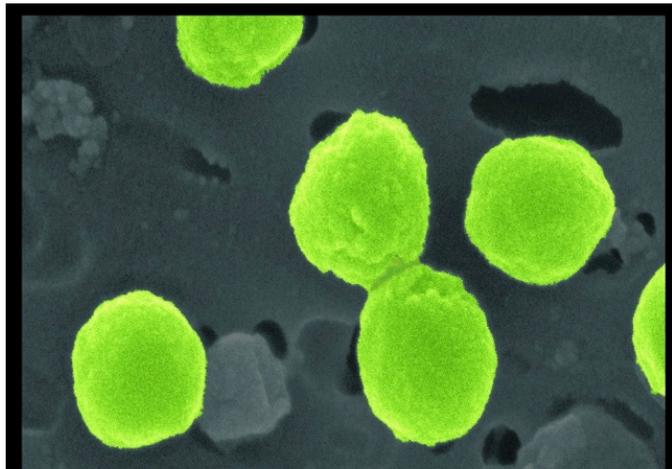
Kasting et al. (1985)

- (2) Because O₃ can be detected by filter photometry
- (3) Because cyanobacteria created O₂ on the early Earth (1 Gyr)

Photosynthesizing marine organisms last 3.5 Gyr

Chisholm estimates that *Prochlorococcus* is responsible for about 5 to 10% of the photosynthesis on Earth today. She traces its origins back 3.5 billion years to cells with mutations that resulted in the release of oxygen into the atmosphere.

"They split water, which is H₂O, and that oxygen was released into the atmosphere..." she said. "So if these cells hadn't discovered, so to speak, photosynthesis, there wouldn't be oxygen in our atmosphere, and we certainly never would have evolved."



<http://www.pbs.org/newshour/updates/tiny-ocean-organism-brought-earth-life/>

Prochlorococcus phytoplankton, this single-celled ocean-dwelling organism, forms the "invisible pasture of the sea" that may be responsible for life as we know it on Earth. Photo by Anne Thompson, Chisholm Lab, MIT

